

WHAT IS CLAIMED IS:

1. A variable valve mechanism for an internal combustion engine, comprising:
  - a camshaft, axially supported by an engine cylinder head, onto which a three-dimensional cam is formed to a profile that changes along the axial direction, said camshaft being axially supported at least on an intake port side of said cylinder head;
  - a rocker shaft actuator configured to change an axial position of a rocker shaft in response to engine operating conditions;
  - a valve lift volume setting mechanism configured to alter an amount of lift of a valve dependent on the extent of axial movement of said rocker shaft;
  - a fuel injector installed on a part of an intake sidewall bordering said intake port of said cylinder head, said fuel injector configured to spray fuel into an intake port; and
  - a concave part formed in said intake sidewall and extending inward toward said camshaft at a location above said fuel injector.
2. The variable valve mechanism according to claim 1, wherein said concave part is formed at least on a part of said intake sidewall directly opposite a fuel injector harness connector.
3. The variable valve mechanism according to claim 1, wherein said fuel injector is installed at said intake sidewall so as to incline said harness connector in a direction away from a sprocket attached to an axial end of said camshaft, and wherein said camshaft is axially supported by said cylinder head so that a maximum lift profile of said three-dimensional cam, said profile being the part of said cam that applies a maximum valve lift, is oriented toward an end of said camshaft to which said sprocket is attached.
4. A variable operating valve apparatus for an internal combustion engine, comprising:

a camshaft, axially supported by an engine cylinder head, said camshaft comprising a three-dimensional cam having a profile that varies along a length of said cam;

a rocker shaft having an axial position that changes in response to engine operating conditions;

a valve lift volume setting mechanism configured to alter the lift of a valve in response to an amount of axial movement of said rocker shaft; and

a fuel injector attached at an intake sidewall, said fuel injector configured to spray fuel into an intake port,

wherein said intake sidewall comprises a concavity adjacent said fuel injector, said concavity permitting said fuel injector to be installed at said intake sidewall.

5. The variable operating valve apparatus according to claim 4, said concavity further comprising an angular depression extending inward in the direction of said camshaft.

6. The variable operating valve apparatus according to claim 4, wherein said concavity is formed opposite a connector associated with said fuel injector.

7. The variable operating valve apparatus according to claim 6, wherein said connector is angled away from a sprocket on said camshaft.

8. The variable operating valve apparatus according to claim 4, said camshaft further comprising a maximum lift profile portion that is oriented toward a sprocket end side of said camshaft.

9. A variable operating valve apparatus for an internal combustion engine, comprising:

a camshaft, axially supported by an engine cylinder head, said camshaft comprising a three-dimensional cam having a profile that varies along a length of said cam;

a rocker shaft having an axial position that changes in response to engine operating conditions;

a valve lift volume setting mechanism configured to alter the lift of a valve in response to an amount of axial movement of said rocker shaft; and

a fuel injector attached at an intake sidewall, said fuel injector configured to spray fuel into an intake port; and

a connector and a fuel rail, each being associated with said fuel injector, and each being attached to a rearward end of a casing of said fuel injector.

10. The variable operating valve apparatus according to claim 9, wherein said connector and said fuel rail are unimpeded by said intake side wall.